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ANALYSIS OF STUDENTS SCIENCE PROCESS SKILLS ON DIGESTIVE SYSTEM LEARNING USING THE 7E LEARNING CYCLE MODEL

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ABSTRACT

This study aimed to obtain data on students' science process skills on the digestive system material for class XI MIPA. This research type is research pre-experimental with one case study. The population in this study were students of class XI MIPA with a sample of 35 students using random sampling techniques. The learning stages in this phase include Elicit, Engage, Explore, Explain, Elaborate, Evaluate and Extend. The data were analyzed with the average value and then analyzed using Anova. The results of this study indicate that the science process skills in nine aspects are classified as very high for observing and communicating (each with a value of 95 and 84.64), that are classified as high are grouping (67.85), predicting (68.57), asking questions (62.85), proposing hypotheses (74.64), and planning research (80.35). Science process skills classified as moderate are aspects of data interpretation (52.85), and those classified as low apply concepts (38.57). Based on the Anova test, the value of science process skills on nine aspects was significantly different at the significance level α <0.05. The conclusion is that students' science process skills are classified as high and have differences in every aspect.

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INTRODUCTION

Science process skills (SPS) are all scientific skills used to find concepts, principles, or theories to develop an existing concept or refute previous findings. These process skills are needed to acquire, develop and apply scientific concepts, principles, and theories (Saputri et al., 2018). SPS is critical for every student as a provision to use the scientific method in developing science to acquire new knowledge or develop the knowledge possessed (Afrizon et al., 2012).

Training and developing SPS will be beneficial for students. SPS can build learning knowledge that is useful in everyday life. SPS is helpful as preparation and practice in dealing with the realities of life in society because it trains students to solve problems logically (Lestari dan Nirva, 2018). However, in reality, SPS has not been widely trained in schools. This as shown from the research results conducted by Ambarsari et al. (2013) which explains that the SPS scenario has not been implemented in schools. Student learning outcomes in SPS are still relatively low due to the lack of biology learning in involving students, the material presented is informative. Andaru et al. (2019) Also explained that student learning outcomes in SPS are still relatively low because the 7E learning cycle model used by teachers is still not suitable for improving SPS.

Students already have SPS in themselves, such as the skills of asking questions, hypothesizing, planning experiments, making observations, clarifying, predicting, interpreting, and communicating. However, these skills sometimes do not appear, so it is necessary to have a learning approach that can bring up students' SPS. One of them is by using the 7E learning cycle model. The 7E learning cycle learning model is a constructivism-based learning model whose learning activities are oriented to student activities. In the process, the 7E learning cycle can facilitate student learning by directly interacting with the environment to analyze social behavior phenomena to understand the concepts of teaching materials so that teaching goals can be achieved. The 7E learning cycle model consists of stages of elicit, engage, explore, explain, elaborate, evaluate and extend.

The success of the 7E learning cycle model is proven by Rohaniyah dan Utiya (2017) hat applying the 7E learning cycle model in learning can improve SPS very well. According to Andaru et al. (2019), the 7E learning cycle learning model contributes to students' scientific skills. Sumiyati et al. (2016) lso said that learning activities on the water cycle process material by applying the 7E learning cycle model positively impacted students. The 7E learning cycle model will also contribute to biology subjects, one of which is the digestive system. Judging from the characteristics of the digestive system subjects with abstract concepts, students find it difficult to imagine how the system works and how the human digestive system works. Therefore, the 7E learning cycle model will help solve these problems scientifically (Zuraida, 2018). o it is important to research to analyze the student's SPS on the material of the digestive system in class XI SMA N 4 Medan, with the implementation of Learning cycle 7E.

RESEARCH METHOD

This research is a pre-experimental type of research with one case study. The population in this study is the entire class XI MIPA as many as ten classes. The sample used in this study was one class with a total of 35 students. The sampling technique in this study is a simple random sampling technique by drawing lots.

The instrument used for data collection in this study was to provide SPS questions. SPS assessed are aspects of observing, classifying, interpreting, predicting, asking questions, hypothesizing, designing research, applying concepts, and communicating. Student SPS scores are obtained by dividing the acquisition score by the maximum score.

After the SPS data (value) was obtained for all students, the following analysis was carried out. First, the data is tabulated, and then the general average value of the SPS is calculated. Furthermore, an analysis is carried out for each aspect of the SPS to see which aspects of the 7E learning cycle learning model are better and less. According to Arikunto (2012) SPS values are then grouped into the five categories listed in Table 1.

Table 1. Student SPS Category

Category	Value
Very high	81-100
High	61-80
Moderate	41-60
Low	21-40
Very low	0-20

To test whether the nine aspects have the same or different averages, the F (ANOVA) test is used to make decisions based on this analysis. If the value is significant (sig.) > 0.05, then the average is the same, while if the value is significant (sig.) <0.05, then the mean is different.

RESULTS AND DISCUSSION

Students' Science Process Skill

In general, students' SPS scores on the food digestive system material are high, namely 69.48. Learning cycle 7E on the digestive system material is proven to be able to explore students' SPS. Based on observations, students not only listen but play an active role in exploring understanding with the concepts being studied. Balta dan Hakan (2016) stated that the 7E strategy has the effect of improving the educational process and encouraging student-centered learning. Likewise with the research conducted by Rohaniyah dan Utiya (2016) reported that the average SPS of students using the 7E learning cycle model got very good and good category. Andaru et al. (2019) also reported that the learning process using the 7E learning cycle model reached 80% in the good category. On research Wijayanti et al. (2014) reported that the SPS of students in the experimental class with the application of the 7E learning cycle model was better at 66.17% compared to the control class, which was 55.91%. Therefore, the 7E Learning cycle contributes to learning outcomes, achievement, and SPS. The SPS observed in this study consisted of nine aspects. The average value of SPS on these nine aspects shown in Table 2.

Table 2. Results of Student SPS Analysis

Skills	Value	Category
Observing	95	Very high
Classifiying	67.85	High
Communicating	84.64	Very high
Predicting	68.57	High
Data interpretation	52.85	Moderate
Questioning	62.85	High
hypothesize	74.64	High
Aplying concept	38.57	Low
Designing research	80.35	High
Average	69.48	High

The average student SPS score on the human digestive system material using the 7E learning cycle model is in the high category, which is 69.48. The average value in the observing aspect is in the very high category (95), while the lowest is the concept application aspect (38.57).

To see the difference between student scores in each aspect of the SPS, the Anova test was carried out using the SPSS 20 application. The ANOVA list can be seen in Table 3, which states that Fcount > Ftable at a significance level of 0.05. So, it can be said that the average value of the nine aspects of SPS is very significantly different. This study analyzes the distribution of students' SPS frequencies in every aspect.

Table 3. The results of the ANOVA test of students' science process skills

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	80679,56	8	10084,94	19,646	0,000
Within Groups	157080,36	306	513,33		
Total	237759,92	314			

SPS: observing aspect.

In the aspect of observing, most students are in the very high and high categories. This result follows Brata & Suriani's (2020) research report, where observing skills occupy the highest score among other process skills. Observing skills are the most basic skills in the process and acquire knowledge in responses to various objects and natural events with the five senses. Therefore, student observations are very high in this aspect because this is the most basic and easy thing for students to do.

The contribution of learning cycle 7E to observing skills can be seen at the Exploration, Explanation, and Evaluation stages. In the exploration stage, students explore based on pictures about the composition of the digestive organs through the Student Worksheet (LKPD). In this phase, students' enthusiasm is seen when they jointly observe and discover the function of the pictures of the digestive organs. Then proceed to the Explanation stage, where students explain the picture of the composition of the digestive organs, which will be evaluated through the Evaluation stage by other group members and researchers.

Table 4. Recap scores on aspects of observing.

Score range	Frequency	Percentage (%)	Category
81 – 100	30	85.72	Very high
61 – 80	5	14.28	High
41 – 60	0	0	Moderate
20 – 40	0	0	Low
0 – 20	0	0	Very low

SPS: classifying.

In the aspect of classifying, some students are in the high and very high categories. Based on Table 5, it can be seen that there are still students who are in the moderate and even low and very low categories. The average SPS for this grouping aspect is 67.85 in the high category. In line with

research conducted by Nensi et al. (2019) who get the results of process skills on the aspect of grouping are 85 in the high category. The factor that causes this skill to be classified as high is because students can group facts to find similarities or differences in the food ingredient test.

Table 5. Recap scores on aspects of classifying.

Score range	Frequency	Percentage	Category
81 – 100	7	20	Very high
61 – 80	24	68.58	High
41 – 60	2	5.72	Moderate
20 – 40	1	2.85	Low
0 – 20	1	2.85	Very low

Learning using the 7E learning cycle model contributes to grouping skills. Table 5 shows that most of the students already have grouping skills. Students are correct in filling out the observation table on the LKPD that has been distributed regarding the substances contained in food and the grouping of food ingredients.

Overall, this SPS indicator is quite adequate, which is 67.85. The average process skill in the grouping aspect is 77.6 with sufficient category. One of the factors that cause this skill to be quite adequate because students are quite able to group facts and data to find similarities or differences in the food ingredients test (Rezeqi, et al., 2020a; Rezeqi, et al., 2020b).

SPS: **communicate**.

The communication aspect can be seen in table 6, where most students get a very high category and even reach above 50%. Some other students got scores in the high and medium categories, but some students got low scores. The average SPS for this aspect is 84.64, with a very high category.

Table 6. Recap scores on aspects of communicate.

Score range	Frequency	Percentage	Category
81 – 100	22	62.86	Very high
61 – 80	9	25.72	High
41 – 60	2	5.71	Moderate
20 – 40	2	5.71	Low
0 – 20	0	0	Very low

Learning using the 7E learning cycle contributes to this. It can be seen in the explanation stage, where students systematically report the results of their experiments and describe the observations in the form of tables obtained in their own words. In addition, communication skills can also be measured or evaluated from the report on the practicum results. Icwanah dan Tutut (2018) emphasize that communication skills are trained to students because everyone needs to express opinions or ideas.

SPS: predicting.

Based on Table 7, it can be seen that most students scored high in the aspect of predicting. Some students scored very high and scored moderately. However, some other students still got low scores. The average SPS for this aspect is 68.57 in the high category. This result in line with the research conducted by Nensi et al. (2019). The indicator predicts getting a very high category, which is 90. In this case, students can predict the causes of diseases caused in the human digestive system.

Table 7. Recap scores on aspects of predicting

Score range	Frequency	Percentage	Category
81 – 100	9	25.71	Very high
61 – 80	17	48.58	High
41 – 60	6	17.14	Moderate
20 – 40	3	8.57	Low
0 – 20	0	0	Very low

Learning with the 7E learning cycle model contributes to predicting skills observed at the exploration and evaluation stages. In the exploration stage, students guess the possible results that will be obtained from the practicum. And at the Extend stage, students predict a particular situation that has never been observed directly based on the knowledge acquired.

SPS: data interpretation.

In this aspect, students' skills are categorized as moderate. There may still be students who get high and even very high scores, as shown in Table 8. However, there are still some students who get low scores. The average SPS for this aspect is 52.85 in the moderate category.

SPS aspects of data interpretation can be observed at the exploration and evaluation stages. In the exploration stage, students observe the observed data. Observational data were then analyzed according to scientific principles. Based on existing theories, conclusions can be obtained that can be proven true (Icwanah dan Tutut, 2018). At the evaluation stage, the students' scores are pretty good. This result indicates that the learning cycle model has a positive influence on students.

Table 8. Recap scores on aspects of data interpretation

Score range	Frequency	Percentage	Category
81 – 100	3	8.57	Very high
61 – 80	5	14.28	High
41 – 60	17	48.58	Moderate
20 – 40	10	28.57	Low
0 – 20	0	0	Very low

SPS: Questioning

In contrast to other SPS aspects, in this aspect, students get an even score. As shown in Table 9 that some students get very high, high, and moderate scores. Some other students still get low and very low scores. The average SPS for this aspect is 62.85 in the high category.

Based on the results of observations for the skill of asking questions, students can formulate problems in the form of interrogative sentences clearly, so as not to cause double interpretation. This skill is essential to practice because asking students questions and improving students' thinking abilities (Ichwanah, 2018).

Table 9. Recap scores on aspects of questioning

Score range	Frequency	Percentage	Category
81 – 100	11	31.42	Very high
61 – 80	7	20	High
41 – 60	8	22.86	Moderate
20 – 40	7	20	Low
0 – 20	2	5.72	Very low

Learning cycle 7E contributes to this aspect which is observed at the extended stage. At this stage, students will expand their knowledge by looking at phenomena related to the material. So that students try to draw or make assumptions about an object or event that occurs. Students ask questions based on their curiosity and will answer these questions based on the information obtained (Gani et al., 2020).

SPS: hypothesize.

In the aspect of proposing a hypothesis, most students are in the very high and high categories. However, some other students still have moderate and low abilities, which is shown in Table 10. The average SPS for this aspect is 74.64 in the high category.

A hypothesis is an allegation that is the answer to a problem formulation before being proven true (Setyowati dan Furqonita, 2007). Making a hypothesis is an essential step in a study, so that this skill is also crucial for students to have as prospective investigators in an experiment. The skill of making hypotheses will produce answers in the form of statement sentences which are still in the form of conjectures and are considered authentic in an experiment.

Tabel 10. SPS Mengajukan Hipotesis

Score range	Frequency	Percentage	Category
81 – 100	16	45.72	Very high
61 – 80	12	34.28	High
41 – 60	3	8.57	Moderate
20 – 40	4	11.42	Low
0 – 20	0	0	Sangat low

The skill of submitting a hypothesis can be seen at the Engage stage, where students are involved in demonstration activities. Students are required to hypothesize by compiling temporary answers to the problems they will discuss or practice.

SPS: Applying concept.

The aspect of applying the concept, students are at low ability and even reach above 50%. However, there are still students who get very high and high skills in this aspect, as shown in Table 11. In line with Nensi et al. (2019) applying the concept is the lowest aspect of process skills.

At this time, implementing the 2013 curriculum to apply the concept is expected to be a bridge in developing students' skills and knowledge. So, this is an important thing to improve. However, in this study, the aspect of applying the concept is categorized as low, namely 38.57.

Table 11. Recap scores on aspects Applying concept.

Score range	Frequency	Percentage	Category
81 – 100	6	17.14	Very high
61 – 80	3	8.58	High
41 – 60	0	0	Moderate
20 – 40	24	68.58	Low
0 – 20	2	5.71	Very low

In learning with the 7E learning cycle model, the skills to apply concepts can be observed at the elaboration and evaluation stages. In the elaboration stage, students conduct discussions to broaden their understanding of the concept and apply the concept in life. However, based on observations, students have not been able to apply the concept. This happens when the researcher in delivering the material, the information provided is only memorized and does not understand it so that when the researcher twists the statement, students are unable to

answer or relate it in a new situation. Seen when these skills are measured or evaluated from the questions given.

SPS: designing research

Aspects of designing research based on Table 12 below show that most students are very high, and some other students have high and moderate skills. However, in this aspect, there are still students who get low or even very low scores. The average SPS for this aspect is 80.35 in the high category.

Tabel 12. SPS Merancang Penelitian

Score range	Frequency	Percentage	Category
81 – 100	21	60	Very high
61 – 80	**5**	14.28	High
41 – 60	5	14.28	Moderate
20 – 40	**3**	8.58	Low
0 – 20	1	2.86	Very low

The contribution of the 7E learning cycle model to practical planning skills can be observed at the engage stage, which is done when students are reading moderately, discussing developing curiosity. Then proceed to the explore stage, wherein this aspect students seek information from various sources, one of which is the textbook they use. Based on observations, most students determine the work steps by looking at the book before they experiment.

SPS on the aspect of planning research is classified as good, namely 80.35. Fitriana et al. (2019) reported that the results of their study on this aspect obtained a moderate category with an average of 51.47. Designing research is an activity that consists of determining the experimental tools to be used, observing the tools to be used, and determining the practical work steps (Pratama et al., 2014). This skill is one of the skills that is observed before learning takes place.

The contribution of the 7E learning cycle model to practical planning skills can be observed at the engage stage, which is done when students are reading moderately, discussing developing curiosity. Then proceed to the exploration stage wherein this aspect, students seek information from various sources, one of which is the textbook they use (Gani et al., 2020; Gani & Arwita, 2020). Based on observations, most students determine the work steps by looking at the book before they do the experiment.

CONCLUSION

This study concludes that the SPS of class XI MIPA students at SMA N 4 Medan is classified as high (69.48). SPS on nine aspects is categorized as very high for observing and communicating (each with a value of 84.50 and 84.64). . Aspects that are classified as high are grouping (67.85), predicting (68.57), asking questions (62.85), proposing hypotheses (74.64), and planning research (80.35). SPS, which is classified as moderate, is the aspect of data interpretation (52.85) and which is classified as low is applying the concept (36.42), and there are significant differences between the nine aspects of SPS students in the digestive system material in class XI MIPA SMA N 4 Medan.

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